**Eisenberg, Olivieri & Associates**
Environmental and Public Health Engineering

# *TECHNICAL MEMORANDUM*

**TO:** **Alameda Countywide Clean Water Program (ACCWP) Trash Work Group**

**FROM:** **Paul Randall and Chris Sommers (EOA Inc.)**

**DATE:** **February 25, 2009**

**SUBJECT: Trash Assessment Pilot Project**

## Introduction

In June 2008, the Alameda Countywide Clean Water Program (ACCWP) formed a Trash Work Group (Work Group) consisting of five Co-permittees (Cities of Oakland, Alameda, Fremont and Dublin and Alameda County). The Work Group was formed to assist in developing and conducting a pilot study focused on assessing trash conditions in selected creeks and shorelines, as well as land based source areas. The Work Group developed the following four objectives for the pilot study:

- Become familiar with existing trash assessment protocols for creek areas and the resources needed to conduct assessments;
- Test the utility of litter audits conducted in/adjacent to local roadways;
- Evaluate the linkage between trash at impacted creek sites, predominant trash sources and pathways, and trash in/adjacent to roadways within the upstream drainage area; and
- Collect information that will inform the revised Municipal Regional Permit (MRP).

The ACCWP contracted EOA, Inc. (EOA) to assist the Trash Work Group in meeting the objectives listed above. To familiarize Co-permittee staff with trash assessment protocols, EOA planned and conducted a trash assessment training workshop July 1, 2008. Work Group staff conducted both creek and land-based trash assessments and submitted data to EOA for analysis and reporting. Preliminary results were discussed with the Work Group finalized based on comments received. The results and conclusions of the pilot assessment project are summarized in this technical memorandum.

## Background

Trash Compliance Requirements under the MRP

The San Francisco Bay Regional Water Quality Control Board's Draft Municipal Regional Stormwater Permit (MRP) for the San Francisco Bay, dated December 4, 2007, includes specific requirements relevant to trash. Section C.8.c of the draft permit requires monitoring of trash condition in creeks using either the Urban Rapid Trash Assessment (URTA) protocol developed by the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), or the Rapid Trash Assessment (RTA) protocol developed by Water Board staff[1]. The permit specifies that trash assessments be conducted at least two times per year at a specific number of sites (determined by population size) in creek areas downstream of trash impacted catchments. In addition, Section C.10 of the MRP specifies trash reduction requirements. Section C.10.a requires Co-Permittees to identify trash impacted catchment areas totaling at least 10

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[1] The URTA and RTA are very similar, with the URTA being more applicable to "urban" creeks.

percent of the "urban land area" within their jurisdictions and implement trash control measures to reduce impacts of trash on beneficial uses of receiving waters. Furthermore, Section C.10.b requires full capture devices to be implemented in an area at least half the size of the trash impact catchment areas.

<u>Existing Trash Assessment Efforts in San Francisco Bay Region</u>

The SCVURPPP has used the Urban Rapid Trash Assessment (URTA) as an assessment tool to characterize trash conditions in Santa Clara Basin watersheds since 2004. During this time, SCVURPPP Co-permittees have conducted 139 URTAs at 51 creek locations within 12 major watersheds in the Santa Clara Basin. These assessments have been primarily conducted at known trash problem areas identified by Co-permittees. SCVURPPP Co-permittees are currently initiating a pilot trash assessment study to develop and test methodologies to better assess trash condition at the watershed scale. Methods are being developed to meet two primary objectives: 1) assess the magnitude and extent of in-creek trash problem areas; and 2) identify trash sources and pathways in creeks, with a focus on trash contribution from Municipal Separate Storm Sewer Systems (MS4s).

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) has characterized trash conditions in 13 San Mateo County watersheds since 2006. The SMCWPPP utilized the Unified Stream Assessment (USA) protocol to determine the extent and magnitude of trash problem areas. In addition, the URTA was applied at selected locations that were identified as the most severe trash problem areas during the USA. The SMCWPPP is currently implementing a pilot trash assessment project in urban areas of San Mateo Creek watershed to identify potential sources and transport pathways of trash that accumulates in the study area. The project is applying a modified version of the URTA over a continuous 0.5 mile section of creek. In addition, the project may evaluate land based trash sources using the modified litter audit methodology.

## Methods

Trash assessments were conducted in both creek and land areas during July and August 2008 by the cities of Oakland, Fremont, Alameda and Dublin; and Alameda County. Trash assessments were conducted at eight creek sites located in the lower reaches of six storm drain catchment or subwatershed areas (Table 1 and Figure 1). In the City of Alameda, two tidally influenced shoreline reaches in close proximity to storm drain outfalls were selected. Co-permittee staff conducted a total of 35 land-based litter audits on roadways within each of the catchments/subwatershed areas. A range of 1 to 12 audits were conducted in each catchment. All assessments were conducted once at each location.

Table 1. Trash assessments conducted in creek and land based sites by 5 ACCWP Co-permittees during July and August 2008.

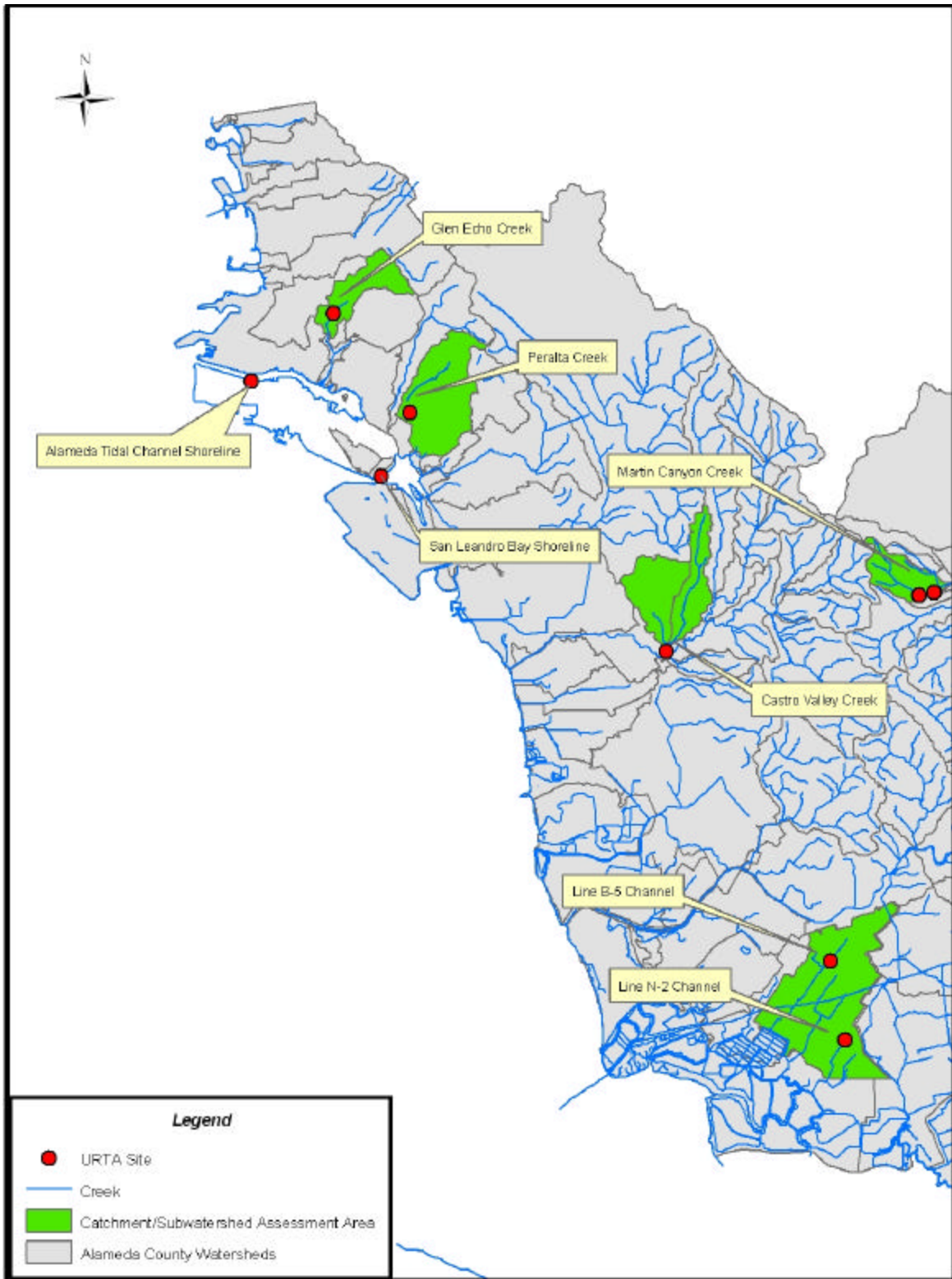| Municipality/Agency | Catchment/Subwatershed | Trash Assessment Sites | |
|---|---|---|---|
| | | Creek/Shoreline | Land-based |
| Dublin | Martin Canyon Creek | 2 | 12 |
| Alameda County | Castro Valley Creek | 1 | 6 |
| Fremont | Line B-5 Channel | 1 | 5 |
| | Line N-2 Channel | 1 | 4 |
| Oakland | Glen Echo Creek | 1 | 1 |
| | Peralta Creek | 2 | 1 |
| Alameda | San Leandro Bay | 1 | 3 |
| | Oakland-Alameda Tidal Channel | 1 | 3 |
| | *Total* | *10* | *35* |

**Figure 1. Urban Rapid Trash Assessment locations at creek and shoreline sites assessed during the ACCWP Pilot Trash Study and associated catchment/subwatershed areas.**

The Urban Rapid Trash Assessment (URTA) protocol (Version 1.0) ([www.scvurppp-w2k.com/trash_manage_act.htm](www.scvurppp-w2k.com/trash_manage_act.htm)) was used to evaluate trash conditions at both creek and shoreline sites. The URTA was applied to either a 100-foot section of creek or channel or a 200-foot section of shoreline, with the exception of the two sites in Martin Canyon Creek (City of Dublin), which were 500 and 600-feet in length. For these sites, the URTA was applied to each 100-foot subsection and the total number of trash items and scores was averaged over the entire reach. Where possible, the starting or end points of the assessment reach were delineated by easily identifiable landmarks (e.g., road crossing, storm drain culvert).

The upper and lower boundaries of the creek banks were defined to distinguish location of trash items found on creek banks (i.e., above the high water line) versus within the creek channel. High water line was defined as the highest location in the channel influenced by peak flow events that can be identified in the field where accumulation of trash and debris occur. For shoreline sites, the location of trash items were categorized as either above or below the area influenced by high tide. The upper extent of the assessment area was defined as the top of riprap lined banks. The shoreline assessments were conducted during low tide and did not include areas submerged in water or covered mudflats. Trash was enumerated and categorized using tally sheets and removed from the site. The URTA includes six condition parameters that relate to a range of issues associated with trash and water quality. The first two parameters focus on qualitative and quantitative levels of trash, the next two parameters evaluate specific types of trash items relevant to water quality and the last two parameters assess how trash enters the creek site (i.e., littering, illegal dumping or accumulation from upstream sources). Attachment A contains URTA survey forms used for pilot assessment.

In addition to the URTA, the City of Dublin conducted field reconnaissance at 18 locations to determine the magnitude and extent of trash problems in 4 creeks (F-4, J-1, J-3 and J-5 Channels). Type and density of trash was documented during the assessment, as well as potential trash sources and pathways.

Co-permittee staff applied a modified Litter Audit (LA) method, developed by MGM Management (www.mgm-management.com/litteraudits.html), to evaluate trash conditions for land areas. The LA was applied to a defined 200-foot length of one side of the roadway that generally included a storm drain catch basin when possible. The width of the assessment area was a variable distance defined as the edge of right of way (e.g., building or fence line at sidewalk) to 1.5-foot distance away from curb (i.e., toward centerline of the street). The maximum width of the assessment area was 18 feet. The location of trash items were categorized as inside or outside the curb line. Trash was enumerated and categorized, using the same tally sheet as the URTA, and removed from the site.

Characteristics for each litter audit site were recorded, including road type, land use, catch point for trash, facility near site (e.g., fast food, school) and qualitative rating score 1-4, with 4 representing high levels of trash. Information on recent trash management activity, including trash clean up, was also documented, if known.

## Results

URTA at Creek and Shoreline Sites

A total number of 9,956 trash items were identified during the 10 creek and shoreline assessments. The total number of trash items at each site ranged from 6 – 4268 (Table 2). The 2 assessment sites in Martin Canyon Creek had the fewest trash items (6 and 17) and the highest URTA total scores (113 and 107). The sites with the highest number of trash items were Castro Valley Creek (4268), Waterford Cove (2070) and both Peralta Creek sites (769 and1207). These sites also had the lowest URTA total scores, 36, 25, 36 and 36, respectively (Table 2). Sites with lowest URTA scores also had lowest parameter scores for persistent, transportable trash items (ranging 0-2) and accumulation trash sources (ranging 2-5) (note: 20 is the highest possible score for both parameters).

Table 2. Total trash items and parameter scores for URTA assessments conducted in 10 creek and shoreline sites in Alameda County (July/August 2008).

| Municipality/ Agency | Waterbody | Location | Date | URTA Assessment Parameters[1] | | | | | | | | Total Score | Total Trash Pieces |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4a | 4b | 5a | 5b | 6 | | |
| | | | | Qual. | Quant | Trans Items | Hazard Items | Access | Dump | Litter | Accum | | |
| Alameda County | Castro Valley Creek | S3 upstream of sewer pipe at USGS Station | 8/12/08 | 8 | 0 | 0 | 5 | 5 | 8 | 8 | 2 | 36 | 4,268 |
| Oakland | Glen Echo Creek | Richmond Blvd at Randwick Av | 8/5/08 | 11 | 13 | 18 | 5 | 4 | 5 | 8 | 15 | 79 | 72 |
| Oakland | Peralta Creek | 100 feet u/s footbridge at Cesar Chavez Park | 7/1/08 | 5 | 3 | 2 | 2 | 1 | 2 | 6 | 5 | 26 | 769 |
| Oakland | Peralta Creek | 100 feet d/s footbridge at Cesar Chavez Park | 7/1/08 | 7 | 0 | 0 | 0 | 2 | 9 | 4 | 4 | 26 | 1,207 |
| Fremont | Line B-5 Channel | Stewart St at Albrae St | 8/13/08 | 5 | 7 | 4 | 9 | 2 | 10 | 9 | 4 | 50 | 436 |
| Fremont | Line N-2 Channel | Handel Cmn at Fremont Blvd | 8/13/08 | 3 | 8 | 4 | 9 | 2 | 10 | 7 | 6 | 49 | 422 |
| Dublin | Martin Canyon Creek | Mape Park | 7/18/08 | 16 | 18 | 19 | 10 | 8 | 10 | 7 | 19 | 107 | 17 |
| Dublin | Martin Canyon Creek | Above Silvergate | 7/18/08 | 18 | 19 | 19 | 9 | 10 | 10 | 9 | 18 | 113 | 6 |
| Alameda | San Leandro Bay | Waterford Cove | 7/23/08 | 5 | 0 | 1 | 0 | 4 | 8 | 3 | 4 | 25 | 2,070 |
| Alameda | Oakland-Alameda Tidal Channel | Main St Outfall #1 | 7/23/08 | 8 | 3 | 8 | 1 | 2 | 10 | 3 | 14 | 49 | 689 |

[1] 20 points is the total maximum score for parameters 1-3 and 6; 10 points is the total maximum score for parameters 4a, 4b, 5a and 5b; 120 is the total maximum score for combined parameters. Higher scores indicate less impacted trash conditions. Refer to Attachment A for parameter descriptions.

Combination of prevalent hazardous trash items (primarily glass) with good public access occurred at both Peralta Creek sites located at a public park and one of the Alameda shoreline sites located at a public beach. Dumping was only identified as a major trash source at the upper Peralta Creek site. Littering was relatively uncommon reported trash source, only identified at lower Peralta Creek site (downstream of footbridge) and both shoreline sites in City of Alameda.

Across all creek and shoreline sites, plastic was the most common trash item (68%) identified during URTAs (Figure 2). Plastic items were primarily composed of Styrofoam (71%), bags (7%), food wrappers (7%) and other soft plastic items (6%). Glass (16%) and biodegradable (9%) are next most common trash items, with the remaining trash types representing about 7% of the total trash identified during the assessments.

Figure 2. Percent of trash types identified during URTA conducted at 10 creek and shoreline sites.
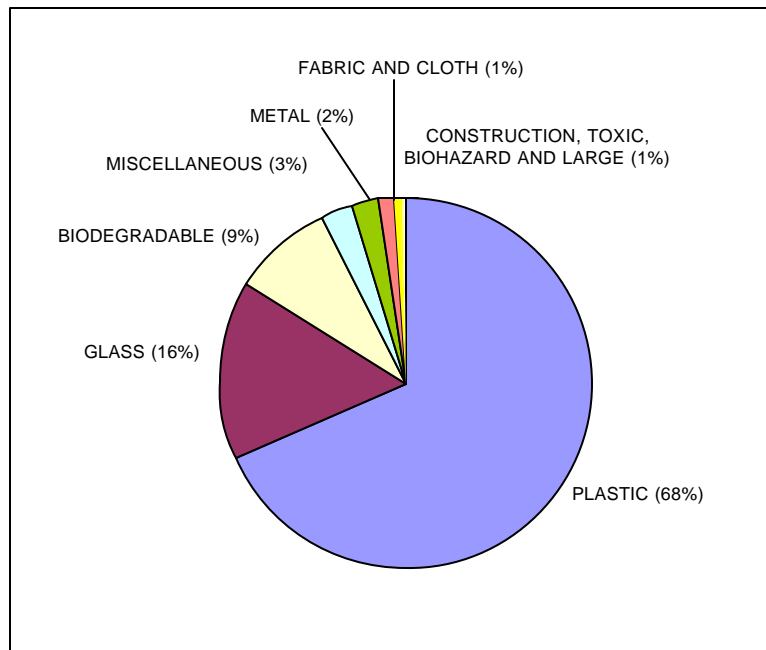


Plastic and miscellaneous trash items combined represent about 71% of the total trash items. Miscellaneous trash types generally include small transportable items such as balls, rubber material, and cigarette butts. These trash categories are used to evaluate Parameter #3: Persistent and Transportable Trash. About 90% of the total glass and 55% of the total biodegradable items were identified at the two shoreline sites in Alameda. The remaining trash types were relatively evenly distributed across all sites. Specific information on trash identified at each URTA site is provided in Attachment B.

Litter Audits at Land-based Sites

A total of 5,699 trash items were identified during the 34 litter audits. The number of trash items at each site ranged from 5 to 807. Approximately 70% of the trash items were identified outside of the curb area (i.e., between curb and edge of right-of-way). Trash types were evenly distributed between miscellaneous (34%), biodegradable (27%) and plastic (25%) (Figure 3). Metal and glass comprised about 10% and the remaining items (fabric, construction, toxic, large and biohazard) were about 4% of the total trash items identified. Specific information on trash identified at each litter audit site is provided in Attachment B.

**Figure 3. Percent of trash types identified during litter audits conducted at 34 land-based sites.**
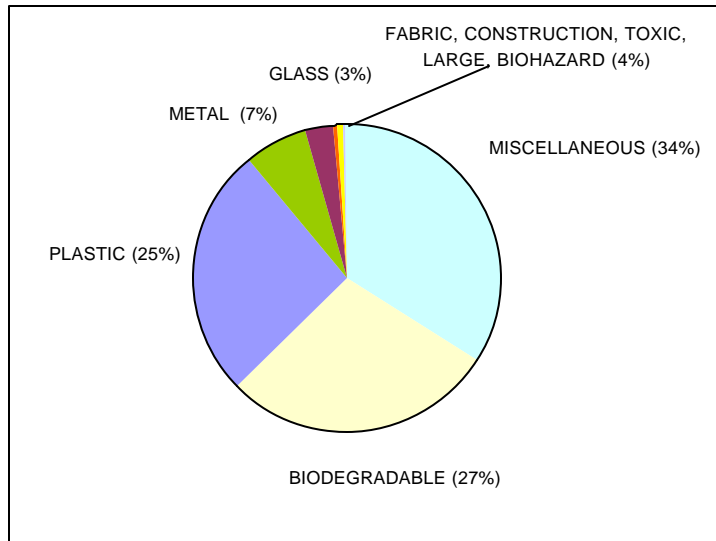


Co-permittees documented five major land use types associated with all litter audit sites (Figure 4). Residential single-family (n=13), mixed (n=10) and commercial (n=7) were three most common land uses reported. The average number of trash items at sites within mixed, commercial and residential single-family land uses was 342, 109, and 80, respectively. Total number of trash items identified across all sites categorized by land use is shown in Figure 4.

**Figure 4. Total number of trash items identified during litter audits at sites characterized by land use type.**
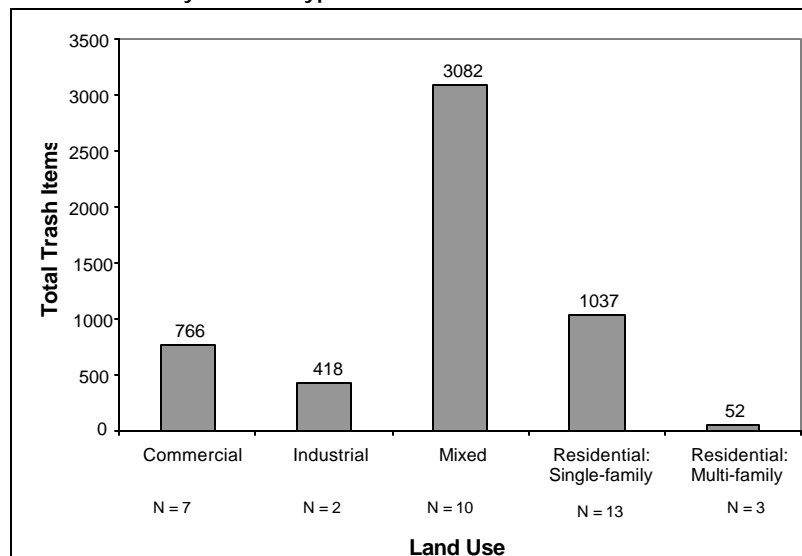


Trash condition ranking scores ranged from 1-3 with an average of 1.7 across all sites (4 is the highest possible score, representing poor trash conditions). Commercial and mixed land uses had the highest average ranking scores, 2 and 1.9, respectively.

## Discussion

Comparison of Trash Conditions at URTA and Litter Audit Sites

A comparison[2] of trash identified during litter audits and creek assessments reveals differences in the proportion of trash types between the creek and on-land sites (Table 3). Plastic trash items were about three times more frequent in creeks, compared to litter audit sites (74% versus 25%). In contrast, biodegradable and miscellaneous trash items were more prevalent at litter audit sites compared to creek sites. One explanation for the low frequency of plastic items (e.g., Styrofoam, bags) identified during litter audits may be that locations other than streets are potentially important source areas for plastic (e.g., parking lots, freeways). Another explanation is that plastic items in creeks are more likely to get deposited and remain in creek areas much longer than street areas. Plastic items may also be getting blown into the storm drain system (e.g., catch basins) by wind or direct littering, and as result, may not be present as frequently in litter audit sites. An evaluation of litter types removed during cleaning of catch basins would be informative for understanding the potential linkages between source areas along streets and trash in creeks.

Table 3. Comparison of trash identified at URTA sites versus litter audit sites. Data for URTA sites only include trash identified below high water line from creek sites

| Trash Type | URTA Sites | | LA Sites | |
|---|---|---|---|---|
| | Total # Trash | % Total | Total # Trash | % Total |
| Plastic | 1842 | 73.5 | 1419 | 25.4 |
| Biodegradable | 183 | 7.3 | 1537 | 27.5 |
| Metal | 135 | 5.4 | 357 | 6.4 |
| Glass | 102 | 4.1 | 159 | 2.8 |
| Miscellaneous | 95 | 3.8 | 1812 | 32.5 |
| Fabric and Cloth | 65 | 2.6 | 32 | 0.6 |
| Construction Debris | 46 | 1.8 | 31 | 0.6 |
| Toxic | 22 | 0.9 | 7 | 0.1 |
| Biohazard | 13 | 0.5 | 0 | 0.0 |
| Large | 2 | 0.1 | 1 | 0.0 |
| Total | 2,505 | 100 | 5,355 | 100 |

Results from litter audits and URTAs did show that (in general), catchments and subwatersheds with the highest number of trash items at land-based source areas (Lines B-5 and L-2, Peralta Creek and Castro Valley Creek) also had highest number of trash items in creek areas directly downstream (Table 4). Ranking scores at litter audit sites and Parameter #3 (transportable trash items) and total URTA scores in creeks had similar patterns. Additional assessment data, however, are needed to better characterize high priority source areas and potential linkages to trash conditions in the creek. In addition, other sources (e.g., littering and dumping at road crossings) should also be evaluated to better understand their contribution of trash to creeks.

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[2] Only the trash identified below the high water line at creek sites was used since trash in the channel may originate from land-based sources that were conveyed via the storm drainage system. Trash from shoreline sites were not used in this analysis due to the potential impacts of trash accumulation from trash sources other than local storm drain outfalls (i.e., tides and currents).

Table 4. Average number of trash items and ranking scores at litter audit sites compared with total number of trash items and URTA scores in creek sites for each catchment/subwatershed assessed during pilot study.

| Municipality/ Agency | Waterbody | Litter Audit | | | URTA[1] | | |
|---|---|---|---|---|---|---|---|
| | | Total # Sites | Ave # Trash Items | Ave Ranking Score | Total Trash Pieces | Parameter #3 Score | Total Score |
| Alameda County | Castro Valley Creek | 6 | 111 | 2 | 445 | 0 | 36 |
| Oakland | Glen Echo Creek | 1 | 17 | 1 | 24 | 18 | 79 |
| | Peralta Creek | 1 | 344 | 2 | 988 | 1 | 26 |
| Fremont | Line B-5 Channel | 5 | 352 | 2.2 | 369 | 4 | 50 |
| | Line N-2 Channel | 4 | 402 | 1.8 | 71 | 4 | 49 |
| Dublin | Martin Canyon Creek | 12 | 43 | 1.2 | 12 | 19 | 110 |

[1] Average value was used for total trash items and URTA scores for Peralta and Martin Canyon Creek.

Utility of Trash Assessment Tools

*Urban Rapid Trash Assessment*

As described in the protocol, the URTA provides a standardized approach that can be used to identify and prioritize trash problem areas, measure trash levels over time, evaluate trash sources and pathways, and identify potential management actions to reduce trash levels at a specific location. The URTA can be used to evaluate effectiveness of management actions when the major trash sources and pathways are present within the assessment area (e.g., litter and dumping at road crossings) and trash impacts from upstream sources are minimal.

One of the main limitations of the URTA is that it only evaluates trash conditions for a specific location (i.e., 100 foot section of creek) within an entire creek system. Trash conditions can be highly variable in urban areas with a wide range of sources and pathways to the creek. The URTA results at selected site(s) may not represent trash conditions for other reaches of the creek. This is especially the case when URTAs are applied at highly impacted areas (e.g., road ways or homeless camps). As a result, URTA results can be highly misleading when applying site-specific data to all reaches of a creek. Furthermore, initial URTA assessments may evaluate trash that has accumulated over a long period of time, depending on site specific conditions (e.g., riparian vegetation), hydrology, and the degree of trash removal efforts at the site. As a result, it is recommended that URTA assessments should be repeated over time to evaluate how persistent trash accumulation is at the site.

The URTA protocol appeared suitable for assessing trash conditions along shorelines. The primary difference compared to use in creek areas was associated with the delineation of study area (i.e., identification of high tide line versus high water line). In addition, shoreline assessments should be conducted during period of low tides; however, certain habitat types (e.g., mudflats) are difficult to assess due to access issues. Similar to creeks, trash conditions along shorelines are presumably highly variable. During the field reconnaissance for site selection, trash densities appeared varies considerably; higher trash levels were observed in areas more impacted by wind and currents (e.g., jetties, edges of coves). As a result, trash conditions documented at selected locations should not be extrapolated to longer reaches of shoreline. In addition, trash that accumulates along shorelines can originate from a wider range of sources (as compared to creek areas) that may include trash disposed of directly to the Bay or in neighboring watersheds that discharge to the Bay. As a result, the utility of URTA data to evaluate potential contributions of trash from creeks or storm drain systems draining directly to shoreline areas may be reduced, given the myriad of sources.

The Trash Pilot Study results also showed sites with the lowest URTA scores (poor conditions) had high levels of trash accumulation from upstream sources or tidal inputs. The URTA does not identify upstream sources and pathways of trash that may impact the site (i.e., storm drain outfalls, litter and dumping at roadways, accumulation from wind). As a result, it is difficult to use assessment results to determine the appropriate control measures needed to reduce trash at the assessment location. Furthermore, it is difficult to use the URTA as a tool to evaluate the effectiveness of trash management actions, especially in creek locations in lower reaches of watersheds that have high levels of trash accumulation from upstream sources (i.e., difficult to implement and evaluate BMPs at sites that have a large number of potential trash sources impacting trash conditions).

The MRP (December 2007 version) includes requirements to implement the URTA at locations downstream of high trash impact catchments to evaluate trash abatement efforts. For reasons stated above, the ability of the URTA to accurately detect the effects of trash management efforts in highly impacted catchments is questionable. Evaluation of BMP effectiveness is further confounded in creeks and shorelines with trash sources that are outside of municipal stormwater program jurisdictions (e.g., freeways, tidal inputs). A separate evaluation of the pilot trash assessments and discussion on the utility of URTA in relation to anticipated MRP requirements was developed by the City of Dublin and included in this technical memorandum as Attachment C.

In summary, the Trash Work Group believes that the URTA protocol may be successfully used to evaluate the condition of trash problem areas, but agrees that the protocol has limited utility in evaluating overall trash conditions at the catchment/watershed scale, especially in creeks that have diverse geomorphology, levels of riparian vegetation, land uses and localized impacts.

*Land-based Litter Audit*

Land-based litter audits provide a standardized protocol to measure trash conditions in street locations, and can be used to identify and prioritize areas for further investigation or management actions. Additionally, litter audits may provide useful information on the type and amount of trash that can potentially be transported to the waterbody for catchments. This information is important because (as discussed above) it is difficult to identify the contribution of trash from storm drain outfalls to waterbodies based on URTA results alone. Additional data are needed, however, to predict what types land use areas, facility types, and watershed characteristics contribute the greatest proportion of trash to waterbodies via the storm drainage system. In addition, additional evaluations are needed to better understand what types of land areas other than streets and curbs may be important trash sources.

## Conclusions

The following conclusions can be made based on the results from the ACCWP Trash Pilot Assessments:

- In general, catchments with the highest level of trash observed during litter audits drain to creek assessment sites that also had the highest amount of trash and lowest URTA scores of all sites assessed (note: this pattern was not apparent for catchments draining into shoreline sites). Plastic trash items were three times more frequent in creek sites compared to street locations, indicating that areas other than streets (e.g., parking lots, freeways) may be important sources of plastic trash items observed in creek areas. In contrast to plastics, biodegradable (e.g., paper) and miscellaneous (e.g., rubber, cigarette butts) items were proportionally higher at street sites compared to than creek sites. The lower incidences of these trash types in creeks may be attributed to the greater potential for conveyance through creek sites to downstream locations (i.e., Baylands). Thus URTAs may not show the full extent of how this type of trash may be contributing to impacts in downstream waterbodies.

- Trash assessments at 4 of the 8 creek sites indicated that accumulation from downstream transport was the primary pathway for trash entering the site. These sites were located in Castro Valley Creek, Peralta Creek and Lines B-5 and L-2 Channels. Accumulation was also identified

as an important pathway for San Leandro Bay shoreline site. The creek sites with low accumulation scores were generally higher in total trash levels and had low total URTA scores compared to other sites.

- The URTA protocol appeared suitable for assessing trash conditions along shorelines. One of the major distinctions with creek assessments, however, is in the evaluation of accumulation sources. Trash that accumulates along shorelines can originate from a wider range of sources (as compared to creek areas) that may include trash disposed of directly to the Bay or in neighboring watersheds that discharge to the Bay. Trash for these source areas can then be transported by tides and currents to shoreline assessment areas. As a result, the utility of URTA data to evaluate potential contributions of trash from creeks or storm drain systems draining directly to shoreline areas may be reduced, given the myriad of sources.

- The URTA provides an evaluation of trash conditions within a 100-foot section of creek and 200-foot section of shoreline. Trash conditions are geographically variable within different segments/sites, and as a result, a minimal number of creek sites may not be representative of longer stream segments. As a result, information gaps exist for understanding overall trash conditions at a watershed scale. Continuous creek walks may supplement URTA data to better understand the magnitude and extent of trash problem areas within an entire creek system.

- The information collected during litter audits provides a standardized tool for assessing trash conditions at streets and may be used to identify and prioritize land-based trash source areas. Due to small number of assessment sites, it was not possible to determine if selected locations were representative of larger areas or if particular land use areas or facility types (e.g., convenience stores) had higher potential to generate trash. Further use of litter audits should consider greater geographic coverage to reduce these uncertainties.

## Recommendations

The Trash Work Group identified the following potential modifications to the URTA and overall trash assessment approach:

- When possible, walk the entire creek segment of interest to document the extent and magnitude of trash and identify locations of trash problem areas. Conduct URTAs at identified trash problem sites, with a focus on those that may be impacted by trash from stormwater outfalls.

- During creek walks, consider enumeration of trash by source and pathway (e.g., litter in creek, accumulation) to identify and prioritize trash sources impacting the creek.

- The length of URTA assessment area should be site specific and not arbitrarily set at 100 feet. For example, URTA sites below road crossings should be defined by sources and pathways of trash impacting the site (e.g., span of bridge)

- Trash characterization is the most time consuming step of the URTA. The identification of trash type (i.e., plastic, metal, glass) however, does not provide information useful for identifying sources and pathways or potential management actions. Future assessments may choose to further consider the utility of collecting this information.

- Detailed trash characterization (e.g., brand names) at selected creek sites downstream of outfalls would provide useful information for identifying to locations of sources in catchment areas draining to the site. Litter audits can then be applied in upstream catchments near suspected source areas to evaluate potential linkages to trash found in creeks.

**ATTACHMENTS**

# Trash Item Talley Worksheet

WATERSHED/STREAM: _____ DATE/TIME: _____
MONITORING GROUP, STAFF: _____ STATION ID_____
STATION NAME/LOCATION:_____

| Trash Assessment Parameter | CONDITION CATEGORY | | | |
|---|---|---|---|---|
| | **Least Disturbed (Optimal Urban)** | **Sub optimal Urban** | **Marginal Urban** | **Poor** |
| **1. Level of Trash** | On first glance, little or no trash visible. Little or no trash evident when streambed and stream banks are closely examined for litter and debris, for instance by looking under leaves. | On first glance, trash is evident in low levels. After close inspection small levels of trash evident in stream bank and streambed. | Trash is evident in medium on first glance. Stream, bank surfaces, and riparian zone contain litter and debris. Evidence of site being used by people: scattered cans, bottles, food wrappers, blankets, clothing. | Trash distracts the eye on first glance. Stream, bank surfaces, and immediate riparian zone contain substantial levels of litter and debris Evidence of site being used frequently by people: many cans, bottles, and food wrappers, blankets, clothing. |
| SCORE | 20  19  18  17  16 | 15  14  13  12  11 | 10   9   8   7   6 | 5  4  3  2  1  0 |
| **2. Actual Number of Trash Items Found** | 0 to 100 trash items found based on a trash assessment of a 100-foot stream reach. | 101 to 250 trash items found based on a trash assessment of a 100-foot stream reach. | 251 to 500 trash items found based on a trash assessment of a 100-foot stream reach. | Over 500 trash items found based on a trash assessment of a 100-foot stream reach. |
| SCORE | 20  19  18  17  16 | 15  14  13  12  11 | 10   9   8   7   6 | 5  4  3  2  1  0 |
| **3. Transportable, Persistent, Buoyant Litter** | Little or no (< 25 pieces) transportable, persistent, buoyant litter such as: hard or soft plastics, styrofoam, balloons, cigarette butts. | Low to medium presence (26-75 pieces) of transportable, persistent, buoyant litter such as: hard or soft plastics, styrofoam, balloons, cigarette butts. | Medium prevalence (76-200 pieces) of transportable, persistent, buoyant litter such as: hard or soft plastics, styrofoam, balloons, cigarette butts. | Large amount (>200 pieces) of transportable, persistent, buoyant litter such as: hard or soft plastics, balloons, styrofoam, cigarette butts; |
| SCORE | 20  19  18  17  16 | 15  14  13  12  11 | 10   9   8   7   6 | 5  4  3  2  1  0 |
| **4. Biohazard, Toxic and Sharp Objects** <br><br><br><br><br><br><br><br><br><br><br><br>**Site Accessibility** | B: Trash contains no medical waste, diapers, pet or human waste. No evidence of toxic substances such as chemical containers or batteries. Only 1 piece of broken glass or metal debris, if any, is present. <br><br>A: Access is difficult, restricted by locked gate or some other physical barrier like steep banks or thick riparian veg. Site reach does not appear to be used by people. Might be private property or protected watershed. | B: No toxic substances, but small presence (2-10 pieces) of sharp objects such as broken glass and metal debris. <br><br><br><br><br>A: Access is limited and site reach does not appear to be used by people. No trails down to creek. | Presence of **any one** of the following: hypodermic needles or other medical waste; used diaper, pet waste, or human feces; any toxic substance such as chemical containers, batteries, or fluorescent light bulbs. Medium to high prevalence (11-50 pieces) sharp objects. <br><br>A: Public access to reach is fair to good but site does not appear to be used frequently, **or** private access is good without any public access. | Presence of **more than one** of the items described in the marginal condition category, and/or high prevalence of (> 50) sharp objects. <br><br><br><br><br>A: Excellent reach access including trails down to and adjacent creek and creekside space for sitting down. Some evidence that reach is used frequently by the public (e.g. rope swings, many beer/soda cans and food wrappers left on the banks, etc.). |
| B SCORE | 10       9 | 8    7    6 | 5    4    3 | 2    1    0 |
| A SCORE | 10       9 | 8    7    6 | 5    4    3 | 2    1    0 |

# Trash Item Talley Worksheet

| Trash Assessment Parameter | CONDITION CATEGORY | | | |
|---|---|---|---|---|
| | **Least Disturbed (Optimal Urban)** | **Sub optimal Urban** | **Marginal Urban** | **Poor** |
| **5. Illegal Dumping** | D: No evidence of illegal dumping. No bags of trash, no yard waste, no household items placed at site to avoid proper disposal, no shopping carts. | D: Some evidence of illegal dumping. Limited vehicular access limits the amount of potential dumping, or material dumped is diffuse paper-based debris. | D: Presence of **one** of the following: furniture, appliances, shopping carts, bags of garbage or yard waste, coupled with vehicular access that facilitates in-and-out dumping of materials to avoid landfill costs. | D: Evidence of chronic dumping, with **more than one** of the following items: furniture, appliances, shopping carts, bags of garbage, or yard waste. Easy vehicular access for in-and-out dumping of materials to avoid landfill costs. |
| **Illegal Littering** | L: Any trash is incidental litter or carried downstream from another location. | L: Some evidence of litter within creek and banks originating from adjacent land uses | L: Prevalent in-stream or shoreline littering that appears to originate from adjacent land uses. | L: Large amount of litter within creek and on banks that appears to originate from adjacent land uses. |
| D-SCORE | 10      9 | 8      7      6 | 5      4      3 | 2      1      0 |
| L-SCORE | 10      9 | 8      7      6 | 5      4      3 | 2      1      0 |
| **6. Accumulation of Trash** | There does not appear to be a problem with trash accumulation from downstream transport. Trash, if any, appears to have been directly deposited at the stream location. | Some evidence that litter and debris have been transported from upstream areas to the location, based on evidence such as silt marks, faded colors or location near high water line. | Evidence that trash is carried to the location from upstream, as evidenced by its location near high water line, siltation marks on the debris, or faded colors. | Trash appears to have accumulated in substantial quantities at the location based on delivery from upstream areas, and is in various states of degradation based on its persistence in the waterbody. A large percentage of trash items have been carried to the location from upstream. |
| SCORE | 20  19  18  17  16 | 15  14  13  12  11 | 10  9  8  7  6 | 5  4  3  2  1  0 |

**Total Score** _____

**SITE DEFINITION**:
UPPER/LOWER BOUNDARIES OF REACH: _____
HIGH WATER LINE: _____
UPPER EXTENT OF BANKS OR SHORE: _____
_____

**NOTES:**
_____
_____
_____
_____
_____
_____
_____

# URTA Trash Item Talley Worksheet

**Station ID_____     Date_____**

**TRASH ITEM TALLY** (Tally with (•) if found above high water line, and (|) below)

| TRASH TYPE | Above (•) | Below (|) | TRASH TYPE | Above (•) | Below (|) |
|---|---|---|---|---|---|
| **PLASTIC** | # Above___ | # Below____ | **METAL** | # Above___ | # Below____ |
| Plastic Bags | | | Aluminum Foil | | |
| Plastic Bottles | | | Aluminum or Steel Cans | | |
| Plastic Bottle Caps | | | Bottle Caps | | |
| Plastic Cup Lid/Straw | | | Metal Pipe Segments | | |
| Plastic Pipe Segments | | | Auto Parts (specify below) | | |
| Plastic Six-Pack Rings | | | Wire (barb, chicken wire) | | |
| Plastic Wrapper | | | Metal Object | | |
| Soft Plastic Pieces | | | **LARGE (specify below)** | # Above___ | # Below____ |
| Hard Plastic Pieces | | | Appliances | | |
| Styrofoam cups pieces | | | Furniture | | |
| Styrofoam Pellets | | | Garbage Bags of Trash | | |
| Fishing Line | | | Tires | | |
| Tarp | | | Shopping Carts | | |
| Other (write-in) | | | Other (write-in) | | |
| **BIOHAZARD** | # Above___ | # Below____ | **TOXIC** | # Above___ | # Below____ |
| Human Waste/Diapers | | | Chemical Containers | | |
| Pet Waste | | | Oil/Surfactant on Water | | |
| Syringes or Pipettes | | | Spray Paint Cans | | |
| Dead Animals | | | Lighters | | |
| Other (write-in) | | | Small Batteries | | |
| **CONSTRUCTION DEBRIS** | # Above___ | # Below____ | Vehicle Batteries | | |
| Concrete (not placed) | | | Other (write-in) | | |
| Rebar | | | **BIODEGRADABLE** | # Above___ | # Below____ |
| Bricks | | | Paper | | |
| Wood Debris | | | Cardboard | | |
| Other (write-in) | | | Food Waste | | |
| **MISCELLANEOUS** | # Above___ | # Below____ | Yard Waste (incl. trees) | | |
| Synthetic Rubber | | | Leaf Litter Piles | | |
| Foam Rubber | | | Other (write-in) | | |
| Balloons | | | **GLASS** | # Above___ | # Below____ |
| Ceramic pots/shards | | | Glass bottles | | |
| Hose Pieces | | | Glass pieces | | |
| Cigarette Butts | | | **FABRIC AND CLOTH** | # Above___ | # Below____ |
| Golf Balls | | | Synthetic Fabric | | |
| Tennis Balls | | | Natural Fabric (cotton, wool) | | |
| Other (write-in) | | | Other (write-in) | | |
| **Total pieces Above:** | | **Below:** | | | **Grand Total:** |
| **Proportion of trash items associated with following sources (total 100%):  Littering:** | | | **Dumping:** | | **Accumulation:** |
| **Specific items found:** | | | | | |

# ATTACHMENT B

Table B-1. Comparison of trash types identified during litter audit sites and URTA creek site in Castro Valley Creek (Alameda County) and Glen Echo and PeraltaCreek subwatersheds (City of Oakland).

| Watershed | Castro Valley Creek | | | | | | | | Glen Echo Cr | | Peralta Cr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Protocol[1] | Litter Audit | | | | | | | URTA Site | Litter Audit | URTA Site | Litter Audit | URTA Upper | URTA Lower |
| Site | A | B | C | D | E | F | Total | | | | | | |
| *Total Number Trash Items* | | | | | | | | | | | | | |
| Plastic | 14 | 1 | 2 | 49 | 44 | 6 | 116 | 349 | 11 | 9 | 122 | 480 | 884 |
| Biohazard | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 5 |
| Construction | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 9 | 0 | 1 | 1 | 12 | 24 |
| Miscellaneous | 0 | 49 | 15 | 80 | 135 | 3 | 282 | 17 | 0 | 2 | 33 | 45 | 36 |
| Metal | 5 | 3 | 2 | 25 | 10 | 1 | 46 | 19 | 1 | 2 | 35 | 34 | 63 |
| Large | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 |
| Toxic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 5 | 12 |
| Biodegradable | 22 | 20 | 0 | 57 | 74 | 6 | 179 | 8 | 5 | 1 | 84 | 135 | 103 |
| Glass | 0 | 2 | 0 | 27 | 2 | 0 | 31 | 23 | 0 | 6 | 69 | 31 | 49 |
| Fabric and Cloth | 2 | 2 | 0 | 2 | 2 | 0 | 8 | 20 | 0 | 2 | 0 | 17 | 30 |
| Total | 43 | 77 | 19 | 240 | 268 | 16 | 663 | 445 | 17 | 24 | 344 | 769 | 1207 |
| Land Use[2] | C | C | RMF | M | C | RMF | NA | RSF, P | RMF | RMF | M | RSF, P | RSF, P |
| Condition Rating | 2 | 2 | 1 | 2 | 3 | 2 | | 36 | 1 | 79 | 2 | 26 | 26 |

[1] Only trash items identified below high water line were used for comparison

[2] Land Use Types: I: Industrial; C: Commercial; RSF- Residential Single Family; RMF: Residential Multi Family; M: Mixed; P: Park; S: School

Table B-2. Comparison of trash types identified during litter audit sites and URTA shoreline sites in two storm drain catchments within City of Alameda.

| Catchment | Main St Outfall – Oakland-Alameda Tidal Channel | | | | | Lincoln Middle School – San Leandro Bay | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Protocol[1] | Litter Audit | | | | URTA Tidal Site | Litter Audit | | | | URTA Bay Site |
| Site | A | B | C | Total | | A | B | C | Total | |
| Total Number of Trash Items | | | | | | | | | | |
| Plastic | 32 | 6 | 70 | 108 | 41 | 6 | 11 | 42 | 59 | 593 |
| Biohazard | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
| Miscellaneous | 6 | 8 | 47 | 61 | 4 | 34 | 21 | 151 | 206 | 8 |
| Metal | 5 | 2 | 15 | 22 | 2 | 3 | 5 | 22 | 30 | 28 |
| Large | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Toxic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| Biodegradable | 23 | 10 | 49 | 82 | 13 | 62 | 19 | 130 | 211 | 11 |
| Glass | 0 | 0 | 5 | 5 | 21 | 0 | 2 | 4 | 6 | 1083 |
| Fabric and Cloth | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 2 | 14 |
| Total | 66 | 27 | 186 | 279 | 81 | 106 | 58 | 352 | 516 | 1741 |
| Land Use[2] | I | M | C | NA | P | RSF | RSF | I | NA | S |
| Condition Rating | 1 | 1 | 2 | | 49 | 1 | 1 | 2 | | 25 |

[1] Only trash items identified below high water line were used for comparison

[2] Land Use Types: I: Industrial; C: Commercial; RSF- Residential Single Family; RMF: Residential Multi Family; M: Mixed; P: Park; S: School

## ATTACHMENT B

Table B-3. Comparison of trash types identified at litter audit sites and URTA sites in two catchments within City of Fremont.

| Catchment | Line B-5 | | | | | | | Line N-2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Protocol[1] | Litter Audit | | | | | | URTA | Litter Audit | | | | | URTA |
| Site | A | B | C | D | E | Total | | A | B | C | D | Total | |
| Total Number of Trash Items | | | | | | | | | | | | | |
| Plastic | 59 | 38 | 275 | 99 | 159 | 630 | 262 | 97 | 59 | 59 | 132 | 347 | 52 |
| Biohazard | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction | 0 | 0 | 9 | 1 | 0 | 10 | 7 | 1 | 5 | 0 | 2 | 8 | 0 |
| Miscellaneous | 13 | 8 | 12 | 51 | 459 | 543 | 11 | 97 | 87 | 106 | 231 | 521 | 2 |
| Metal | 13 | 8 | 11 | 21 | 38 | 91 | 20 | 25 | 9 | 21 | 66 | 121 | 12 |
| Large | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| Toxic | 0 | 0 | 0 | 0 | 1 | 1 | 9 | 1 | 1 | 2 | 1 | 5 | 0 |
| Biodegradable | 117 | 77 | 35 | 107 | 102 | 438 | 40 | 75 | 37 | 45 | 359 | 516 | 3 |
| Glass | 0 | 0 | 32 | 6 | 7 | 45 | 14 | 0 | 37 | 24 | 6 | 67 | 0 |
| Fabric and Cloth | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 7 | 10 | 20 | 1 |
| Total | 202 | 131 | 374 | 285 | 766 | 1758 | 369 | 297 | 238 | 264 | 807 | 1606 | 71 |
| Land Use[2] | M | M | M | RSF | M | NA | M | M | M | RSF | M | NA | M |
| Condition Rating | 2 | 1 | 3 | 2 | 3 | | 50 | 1 | 1 | 2 | 3 | | 4 |

[1] Only trash items identified below high water line were used for comparison.

[2] Land Use Types: I: Industrial; C: Commercial; RSF- Residential Single Family; RMF: Residential Multi Family; M: Mixed


Table B-4. Comparison of trash types identified during litter audit sites and URTA creek sites in Martin Canyon Creek subwatershed in the City of Dublin.

| Subwatershed | Martin Canyon Creek | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Protocol[1] | Litter Audit | | | | | | | | | | | | | URTA 1 | URTA 2 |
| Site | A | B | C | D | E | F | G | H | I | J | K | I | Total | | |
| Total Number Trash Items | | | | | | | | | | | | | | | |
| Plastic | 9 | 7 | 18 | 38 | 19 | 3 | 6 | 6 | 8 | 30 | 1 | 3 | 148 | 9 | 3 |
| Biohazard | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 3 | 3 | 0 | 0 | 10 | 0 | 0 |
| Miscellaneous | 21 | 8 | 31 | 45 | 11 | 4 | 9 | 21 | 37 | 7 | 2 | 3 | 199 | 0 | 0 |
| Metal | 3 | 4 | 10 | 5 | 1 | 6 | 2 | 2 | 5 | 6 | 0 | 2 | 46 | 0 | 0 |
| Large | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Toxic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Biodegradable | 11 | 3 | 7 | 7 | 6 | 9 | 13 | 4 | 12 | 31 | 2 | 1 | 106 | 8 | 0 |
| Glass | 1 | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 5 | 0 | 0 |
| Fabric and Cloth | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Total | 47 | 22 | 68 | 95 | 37 | 23 | 32 | 36 | 65 | 77 | 5 | 9 | 516 | 17 | 3 |
| Land Use[2] | RSF | RSF | RSF | C | RSF | RSF | C | RSF | C | RSF | RSF | RSF | NA | P | RSF |
| Condition Rating | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | | 107 | 113 |

[1] Only trash items identified below high water line were used for comparison.

[2] Land Use Types: I: Industrial; C: Commercial; RSF- Residential Single Family; RMF: Residential Multi Family; M: Mixed; P: Park

**ATTACHMENT C**

City of Dublin

Pilot Trash Assessment

August 18, 2008

**Background**

The City of Dublin conducted a series of pilot trash assessments in July, 2008, in order to characterize trash problems in the City and to develop a sample compliance program for draft trash abatement measures required under Section C.10 of the proposed Municipal Regional Permit for Stormwater. In addition, the study was intended to provide a basis for input to the San Francisco Bay Regional Water Quality Control Board on how Section C.10 could be modified to better reflect actual trash conditions and to provide local agencies with greater leeway in addressing actual conditions.

The assessments were conducted in the western (older) portion of the City. The assessments were conducted within watersheds containing a mix of single family residential neighborhoods, commercial and retail areas, and permanent open space, as well as several schools and the I-680 right-of-way. The older portion of the City was chosen as it predates the 1987 changes to the Clean Water Act involving storm water quality and has the most potential for trash and other water quality issues. The assessments included the following:

1) An informal stream assessment conducted at eighteen locations within two separate watersheds (July 1, July 8, and July 10, 2008)

2) A series of twelve Urban Rapid Trash Assessments conducted over two 600' long contiguous sections of a creek (July 18, 2008). Trash was removed from these sections of creek.

3) A series of Litter Audits conducted at twelve locations for a 200' section of public streets (July 8 and July 11, 2008).

**Observations**

1) The F-4 Flood Control Channel east of I-680 had noticeable levels of trash along a reach approximately one mile in length. Trash was most notable on those portions of the channel directly adjacent to Village Parkway, and at several outfalls.

2) The lowest reach of the F-4 Channel, immediately upstream of its confluence with the Alamo Canal, contained much lower levels of trash, with little trash accumulation at the outfalls.

3) The J-1, J-3, J-4, and J-5 Flood Control Channels west of I-680 generally had only nominal amounts of trash, except at three locations, described below.

4) The J-3 Channel (Martin Canyon Creek), adjacent to Mape Park, was relatively free of trash where the creek was readily visible at a pedestrian crossing. Trash accumulation was increasingly denser upstream of this location as the creek become obscured by vegetation.

5) Noticeable levels of trash were present in the J-1 Channel downstream of the San Ramon Road/ Bellina Street intersection.

6) Very noticeable levels of trash were present in the J-1 Channel immediately downstream of Amador Valley Boulevard, extending south to Dublin Boulevard.

7) The J-2 Channel outfall into the J-1 Channel (just north of Dublin Boulevard), which is a closed pipe serving the bulk of the central commercial district west of I-680, was relatively free of trash and debris at the outfall.

8) Trash levels on streets were the highest on Village Parkway (within the central commercial district), followed by San Ramon Road (an arterial street), with lower levels on residential, with the lowest levels on Silvergate Drive, a collector street located within a residential neighborhood.

9) Although trash was highly visible in several locations, at none of the sites did the trash accumulation levels exceed the Urban Rapid Trash Assessment standard of Urban Optimal (100 pieces of trash w/in 100' of stream).

10) Zone 7 Water Agency crews, sent at the request of the City to clean the trash in the J-1 Channel at Amador Valley Boulevard, reported that trash was entering the creek from I-680 even as the crews were completing the cleanup.

11) Adjoining commercial uses (specifically the Safeway store) adjoining the J-1 Channel were generating significant amounts of windblown trash from open, uncovered dumpsters, from the loading dock, and from the parking lot.

12) There is little or no evidence of dumping observed at any of the sites.

13) The lack of trash observed at the various sites along the J-3 Channel is consistent with prior observations by staff and volunteer groups in February 2007, March 2008, and April 2008.

**Conclusions**

The F-4 Channel provides drainage for single-family neighborhoods, as well as a portion of the central commercial district, which has a preponderance of fast food and take out establishments, as well as two high schools. The high schools are within walking distance

of the commercial district, with walking routes immediately adjacent to the channel. Trash observed in these areas included fast food containers, and was located on the channel banks as well as within the channel. The outfall locations with the highest levels of trash either drain the commercial district or the high schools, or drain streets with high pedestrian traffic to and from the commercial district or the schools.

In contrast, the lower section of the channel is isolated from adjoining public streets and is downstream of the commercial district, serving single-family neighborhoods.

Based on this, the source of trash in the F-4 channel is likely (a) direct littering on the streets adjacent to the channel, (b) windblown trash from the commercial area, (c) windblown trash from streets that serve as routes to school, (d) transport in the storm drain system from commercial areas, and (e) transport in the storm drain system from streets that serve as pedestrian routes to school. Trash is NOT being generated in significant amounts from adjoining single-family residential neighborhoods.

The J-series channels provide drainage for single-family neighborhoods, as well as isolated commercial areas, elementary schools, and significant areas of permanent open space. In addition, runoff from the I-680 right-of-way is discharged directly into the J-1 Channel.

With the exception of the three locations described, trash accumulation in the channels was significantly lower than that found in the F-4 Channel, and in some cases was nominal or nonexistent.

The concentration of trash in the J-3 Channel adjacent to Mape Park appears to be due to windblown litter from the picnic areas immediately adjacent to the creekbank. Although the park is maintained on a daily basis, it appears that trash removal is not being performed due to the creek not being readily visible and accessible from the rest of the park.

The higher level of trash in the J-1 channel near the San Ramon Road/ Bellina Street intersection is likely due to litter thrown from San Ramon Road (an arterial street), as well as windblown trash from several commercial centers at the San Ramon Road/ Alcosta Boulevard intersection, and possibly the Alcosta Boulevard/ I-680 Interchange. The lack of trash in residential areas upstream of San Ramon Road supports this conclusion.

The very high accumulation of trash in the J-1 channel just south of Amador Valley Boulevard can be attributed to several sources. At this point, the concrete-lined channel transitions to an earth/ grass channel. There is a large amount of vegetation in the channel immediately south (downstream) of Amador Valley Boulevard, which appears to be trapping trash transported from upstream. It is possible that debris floats freely along the J-1 channel and is trapped below Amador Valley Boulevard. As noted above, there is some amount of trash being generated near the upstream San Ramon Road/ Amador Valley Boulevard intersection. It was also observed that within the J-3 channel,

immediately upstream of its confluence with the J-1 Channel (north of Amador Valley Boulevard) there is a similar amount of vegetation, with very little trash trapped in the J-3 Channel. This suggests that very little of the trash in the J-1 Channel is being generated in the J-3 watershed, which is consistent with other observations in the J-3 watershed.

Amador Valley Boulevard is the boundary of the north end of the City's central commercial district (the land to the north is primarily single family residential). There is a 30" storm drain outfall providing drainage for a portion of the commercial district that enters the J-1 Channel at Amador Valley Boulevard. This pipe may be contributing to the trash in the J-1 Channel. In addition, miscellaneous windblown trash may be entering the channel from the commercial district.

Amador Valley Boulevard also marks the location of the south end of a sound wall on the I-680 right-of-way. The lack of a sound wall south of Amador Valley Boulevard would allow windblown trash to enter directly into the J-1 Channel. This is supported by an accumulation of trash that was observed on a fill slope along the west side of I-680, as well as observations by Zone 7 crews attempting to clean trash out of the channel.

A significant source of trash with the J-1 channel was the adjoining Safeway market just north of Dublin Boulevard. Inspection showed numerous of pieces of trash on the channel bank and along the channel access road. The loading dock did not have a covered enclosure for trash dumpsters, and the dumpster lids were open. The wrought iron fence along the Zone 7/ Safeway property line had been fitted with chicken wire on the Safeway side, indicating that trash had been observed at some point in the past as a long-term problem.  The fence, unfortunately, had been damaged and pushed out of place by a truck, and was no longer functioning.

(It is noted that Safeway was made aware of the problem by the City and has since cleaned up the trash, both onsite and within the Zone 7 property, and is in the process of replacing the fence with a more effective screen, as well as making a number of operation and housekeeping practices to reduce further windblown trash. The City will be conducting a follow-up inspection in September under its business inspection program. Also, both Zone 7 and Caltrans were notified of the trash problem on the properties and have removed the trash between Amador Valley Boulevard and Dublin Boulevard. Trash is already beginning to accumulate in the J-1 Channel).

Based on this, the source of trash in the J-series channels is likely (a) windblown trash from the specific commercial uses adjacent to the J-1 Channel, (b) windblown trash from I-680,  (c) transport in the storm drain system from the adjacent central commercial district, (d) transport in the storm drain system from portions of San Ramon Road, (e) miscellaneous windblown trash from the adjoining central commercial district, and (f) transport in the J-3 channel from Mape Park. Trash is NOT being generated in significant amount from adjoining single-family residential neighborhoods.

**Potential Enhanced Trash Abatement Measures**

**ATTACHMENT C**

Based on the above, the City would continue the following activities that it is currently performing at their current levels:

1) Weekly street sweeping of non-residential areas and twice-monthly street sweeping of residential areas.

2) Annual inspection and cleaning of storm drain inlets.

3) Daily cleaning and maintenance of City parks and other City facilities.

4) Continued inspections of businesses on a five-year rotating basis for water-quality issues, under the current Five-Year Business Inspection Plan.

5) Annual inspection of private stormwater measures and annual maintenance of City-maintained measures under the O&M program.

6) Continue review of land use new development and redevelopment projects to require installation of trash abatement measures such as covered and plumbed trash dumpster enclosures and trash capture devices.

7) Continue work with Caltrans to finalize an agreement to install two hydrodynamic separator units on two storm drain outfalls serving the Village Parkway commercial area (F-4 Channel), as an alternate mitigation project for the I-680 HOV project.

The City would NOT perform the following enhanced measures:

1) Increased frequency of street sweeping.

2) Creation of parking restrictions on sweeping days.

The City WOULD initiate the following enhanced measures:

1) Modify maintenance activities at Mape Park to ensure that the adjoining creek channel is kept clear of trash.

2) Increase the frequency of business inspections to include all businesses with a potential for trash generation (such as food service and markets) within a short-term period (such as 1-2 years). Focus follow-up efforts at businesses with trash problems, and consider annual inspections for businesses with problems until the problems appear to be resolved in a permanent manner (the Safeway problem is a good example). Encourage businesses to install structural changes where operational changes are not effective. Relax the five-year inspection interval for businesses with a low potential for trash generation.

This would include a supplemental review of the businesses and storm drain system adjoining the J-2 Channel (closed pipe) with the central commercial district.

3) Continue to notify other public agencies of trash problems observed on their properties.

4) In areas where littering appears to be the source of trash, install additional trash receptacles.

5) Install filter inserts in storm drain inlets on San Ramon Road (from the City limits at Alcosta Boulevard) south to I-580. This would require 30-40 inserts, at a cost of $30-40,000. The insert device under consideration treats only the runoff entering the inlet (this is not an in-line device) and includes a filter that traps other pollutants.

6) Install filter inlets in storm drain inlets on Village Parkway and Amador Valley Boulevard. This would require approximately 25 inserts on Village Parkway and 20 inserts on Amador Valley Boulevard.

7) Consider areas where in-line hydrodynamic separators could be utilized instead of individual filter inserts and/ or as an enhancement to trash abatement efforts on private property, based on analysis of initial vs. long-term maintenance costs, potential cost contributions by property owners, and consolidation of treatment measures and reduced O&M efforts.

8) In cooperation with the Zone 7 Water Agency, determine locations where volunteer cleanup efforts could be effective in removing random litter on an annual basis.

The above efforts are limited to the pilot study area. It would be the City's intent to extrapolate the conclusions found under the pilot study to the remainder of the City in order to comply with the upcoming regional stormwater permit, and not conduct a City-wide assessment at the level performed under the pilot study.

**Comments on the Municipal Regional Stormwater Permit**

Following completion of the pilot study, City staff reviewed Section C.10 of the Municipal Regional Stormwater Permit to determine if the pilot study findings would cause the City to alter its previous comments to the Board regarding the MRP.

Based on further review of the MRP, the following comments are noted:

1) Section C.10.a(i) requires that the high trash impact catchments shall total at least 10% of the City's land. Based on the pilot study, the catchment area should be based on land uses and NOT an arbitrary 10% requirement.

2) This section should allow for an exclusion of land contained within State Freeway or Highway right-of-ways. These right-of-ways, while likely high generators of trash, are not subject to local agency enforcement and should be excluded from the trash catchment base.

3) Section C.10b(i) requires that enhanced trash control measures be provided through the installation of full trash capture devices within half of the trash catchment area, which is 5% of a City's land. The trash control measures should be based on evaluation of the extent of the problem AND the most appropriate means of dealing with the trash, NOT an arbitrary 5% of the City's land.

Based on the catchment area included in Dublin's pilot assessment efforts, two of the worst sources of trash were (1) the I-680 right-of-way and (b) an adjoining supermarket. Since the I-680 right-of-way drains directly to a flood control channel, modifications to the City's drainage system would have no impact on the problem. Increased litter pickup, sweeping, or structural controls by Caltrans would be needed to address this problem. At the second site, staff initiated a cleanup effort by the property owner and is continuing to work with the owner to implement operational and structural changes to prevent a recurrence of the problem (It is noted that the market site already has trash capture devices at the twelve inlets on the site; these devices are not effective in dealing with trash that lies on the ground and is picked up by wind prior to the rainy season).

Local agencies should be given the opportunity to address trash problems through enhanced inspections and enforcement in lieu of mandatory trash capture devices.

4) Section C.10b(i)(1) (Enhanced Trash Management Control  Measures) requires mandatory street sweeping day parking restrictions AND increased street sweeping in the other half of the trash catchment area. Based on Dublin pilot assessment, much of the litter problem originates on private property due to poor housekeeping by businesses. This problem can best be dealt with by more aggressive business inspections and follow-up.

The cost of signs for street sweeping restrictions is not insignificant, and the cost of signing should be weighed against more effective use of the funds on other activities. The need for additional street sweeping and parking restrictions should be determined by the local agency based on an assessment of the trash problem, and not be an arbitrary condition of the permit.

5) Compliance with the monitoring requirements for trash under Section C.8 requires monitoring using the URTA method two times a year at locations downstream of the 10% trash catchment area. In the City of Dublin, this would involve dozens of outfalls and 50-100 URTA's per year for the duration of the permit. This is a substantial commitment of staff time. While there is value in tabulating individual trash items by number and type at each location as part of the initial assessment (in order to characterize the trash problem and to develop effective abatement measures), the value in repeating this process year after year is unclear. The monitoring process should be modified to allow a simpler process than the URTA (such as counting total numbers of trash pieces, total volume of trash removed using bag counts, qualitative evaluation using photos, etc.) that would document the effectiveness of control measures in a less time intensive manner.

**ATTACHMENT C**

6) Section C.10b(ii) requires that trash abatement efforts be evaluated by ongoing Urban Rapid Trash Assessment monitoring. Based on the pilot assessment by Dublin using URTA's and informal stream assessments, all of the creeks studied meet the URTA's definition of "Urban Optimal". Based on this, it would appear that Dublin's current trash abatement measures are effective, or the problem simply doesn't exist at a level to be of concern. It is also unclear how ongoing monitoring could demonstrate better results, if optimal results are already being achieved.

The City of Dublin acknowledges that opportunities exist for new trash abatement measures within it's jurisdiction (as described above), but does not see value obtained from the expense and effort of ongoing URTA monitoring within it's jurisdiction and requests that it be relieved of this requirement.